980 9th Street, Suite 1500
Sacramento, CA 95814
www.deltacouncil.ca.gov

## Information Item

# Discussion Regarding Risks to Delta Assets of Significant State Interest and Update on the Delta Levees Investment Strategy

**Summary:** Staff will present information describing risks to State interests in the Delta due to potential levee failures and discuss how accounting for these risks can inform the development of the Delta Levees Investment Strategy (DLIS). The DLIS will inform prioritization of State investments in levee operation, maintenance, and improvements in the Delta in accordance with Water Code section 85306.

## Background

At the April 2015 Council meeting, staff and the Arcadis team presented maps showing where State interests are protected by levees within the Delta and Suisun Marsh and also, in the case of habitat, where potential tidal habitats could be restored if levees were altered. The information included population, property and other assets' values, islands that support water supply, current and potential upland and freshwater habitats, potential tidal habitat locations, and locations supporting the Delta's unique values.

For today's briefing, staff will present an overview of islands and tracts within the Delta and Suisun Marsh where risks to these State interests, due to potential levee failures, have been identified. Staff also will discuss possible implications of using this information to inform development of a risk reduction strategy.

### Risk Analysis

Estimates of current and future risks to Delta flooding have been developed based on existing data. These estimates provide the baseline needed to evaluate risk reduction that may be achieved under various levee investment portfolios. The DLIS project team estimated probability of flooding (due to both riverine flooding as well as seismic failure), expected annual damages, expected annual fatalities, risk of water supply disruption, ecosystem impacts, and potential impacts to Delta as Place values. The risk metrics used to measure the impacts of floods have a common underpinning: the likelihood of flooding. While it is not possible to know precisely when a flood will occur, it is possible to estimate how likely a flood of a particular severity or an earthquake capable of damaging levees would be in any given year. This estimate, combined with the various consequences of levee failure, leads to the measures of risk.

## Risks to State Interests

Council staff and the Arcadis team have developed representative maps showing where risks to State interests within the Delta and Suisun Marsh have been evaluated. To identify the relative risk of flooding for each island, the DLIS team compiled the best available information regarding Delta islands and tracts, flood and earthquake occurrence probabilities, levee conditions, and the assets and resources protected by Delta levees.

Most information on assets was obtained from previously published reports prepared for the California Department of Water Resources (DWR). The DLIS team also relied on information from several other agencies including the U.S. Census Bureau, the U.S. Environmental Protection Agency, the California Energy Commission, the California Department of Conservation, the California Department of Fish and Wildlife (DFW), and the California Natural Resources Agency.

The DLIS team made extensive use of the best available data related to threats, hazards, and levee fragility in the Delta. Much of the information for the ecosystem came from the Delta Plan and California EcoRestore. Wherever possible, the data obtained for DLIS was reviewed with federal, State, and local agency personnel, water supply contractors, local reclamation districts, and key stakeholders including Delta leaders and residents, and non-governmental organizations. Information obtained through this review process was used to update the DLIS database and to fill in gaps that existed in specific locations in the Delta. The DLIS methodology enables updates as new information becomes available.

While it is not possible to know precisely when a flood will occur, it is possible to estimate how likely a flood of a particular severity would be in any given year; DWR and the U.S. Army Corps of Engineers (Corps) have calculated this for the Delta. Based on this published data, the annual probability of a levee breech causing a flood, is determined by the likelihood of a flood or earthquake occurring. The risks shown in the attached maps are the product of the annual probability of an island flooding because of levee failure multiplied by the consequences for each particular metric such as life, property, disruption to water supply, etc. Attachment 1 shows the annual probability of leveed islands within the Delta and Suisun Marsh flooding due to a levee failure. This annual probability of flooding ranges from about 18 percent for a 400-acre tract on the northern tip of Suisun Marsh's Grizzly Island, noted as DLIS-46 in the tool, to near 0 percent for a handful of islands and tracts.

Attachment 2 shows where Arcadis' analysis indicates that the greatest risks have been identified for life, property, water supply disruption, current and potential freshwater habitats, and locations supporting the Delta's unique values under current conditions.

- Life. Expected annual fatalities (EAF) is a commonly used, widely accepted risk-based calculation of the average annual number of flood-related fatalities that would be anticipated in a region for a given set of potential flooding conditions. Even though floods may occur on an infrequent basis, EAF is expressed as number of

flood-related fatalities that could be anticipated per year. Estimating EAF for the Delta and Suisun Marsh is challenging because, although flood frequencies are reasonably well known, very few, if any, flood-related fatalities have been recorded. In DLIS, EAF was calculated using procedures in accordance with those used by the Corps, the US Bureau of Reclamation, the Federal Emergency Management Agency, and in other countries such as the United Kingdom, Japan, and the Netherlands. The map shows risk to life for each island and tract.

As one would expect, the most populous areas of the Delta have higher risks to life. Maintenance Area 9, which includes the Pocket neighborhood of Sacramento, has an EAF rate of 3 lives. The Sacramento Area Flood Control Agency is doing extensive work to reduce the risk of flooding in this area. Many islands and tracts in the Delta and Suisun Marsh have expected annual fatality rates less than 0.1. It is important to note that the relatively low EAF in many places in the Delta is driven more by the Delta's low population than by the probability of flooding.

- Property. For the DLIS, the loss estimation methodology is based on guidance from the Corps. The computation of flood loss is based on data that has natural variability; hence, flood loss is expressed as an expected (average) annual value; commonly referred to as expected annual damage (EAD). This map shows risk to property that could be damaged by flooding. The highest EAD is $92.8 million in the Maintenance Area 9 (the Pocket neighborhood of Sacramento). Out of the 140 leveed islands and tracts in the Delta and Suisun Marsh, 18 have an EAD less than $200,000.
- Water Supply. This map shows islands and tracts that pose the greatest risk to water supply disruption. Grizzly Island in Suisun Marsh, which protects control gates and water distribution systems built to manage the marsh's wetlands, has a 16.2 percent annual probability of flooding. The majority of islands and tracts where levee failures would have potential impacts to water supply have an annual probability of flooding less than four percent.
- Non-tidal Habitat. This map shows the risk to high-value non-tidal habitat. These include managed wetlands, such as DFW's Grizzly Island Wildlife Area, as well as uplands important to wildlife, such as The Nature Conservancy's Staten Island.
- Delta as a Place. These maps show risks to Delta as Place metrics discussed at previous Council meetings. These metrics include, legacy towns, agricultural areas, and public roadways.

## Considerations for DLIS Development

Understanding where the risks to State interests are highest helps inform the prioritization of levee investments. This information can help inform the Council's consideration of which levees are most important to protecting State interests and may warrant State investment for levee improvements to reduce risk.

Understanding current state funding sources and programs is also important as we proceed with making recommendations in the context of a Delta Plan risk reduction amendment. More detail regarding these programs is available in our white paper:

http://deltacouncil.ca.gov/sites/default/files/2015/01/15-0109_Levee_Investment_Strategy_Issue_Paper.pdf.

Improvements to levees that protect these State interests are funded through State funding programs such as DWR's *Delta Levees Special Projects Program*. This program can provide financial assistance to local levee maintaining agencies for improvement or rehabilitation of levees in the Delta. It can fund up to 100 percent of project costs. The program has provided more than $350 million to the Delta's local agencies for flood control and related habitat projects since its inception.

The *Special Projects Program's* initial focus was limited to the eight western Delta Islands—Bethel, Bradford, Holland, Hotchkiss, Jersey, Sherman, Twitchell and Webb—and the communities of Thornton and Walnut Grove. In 1996, Assembly Bill 360 expanded the *Special Projects Program* to include the entire Delta and portions of Suisun Marsh (approximately 12 miles of levees on islands bordering the Northern Suisun Bay from Van Sickle Island westerly to Montezuma Slough) (Water Code Section 12311(a)). Today, any project or non-project levee in the Delta's primary zone or a non-project levee in the secondary zone is eligible for *Special Projects* funding, developing priorities of DWR's periodic project solicitation packages.

*The Suisun Marsh Plan,* which was developed by multiple State and federal agencies and approved in 2014*,* identified a need to expand public funding for Suisun Marsh levees beyond its current limit in the *Special Projects Program*. The Council may want to discuss this need as part of an overall risk reduction strategy for the Delta and Suisun Marsh.

While the *Special Projects Program* can fund substantial levee improvements, DWR's *Delta Levees Maintenance Subventions Program* can fund levee rehabilitation projects. This program can fund annual routine maintenance up to $20,000/mile. Expenses beyond $20,000/mile are considered improvements beyond maintenance under this program and may be funded if they improve levees to meet Bulletin 192-82 standards or the Delta Specific PL 84-99 standards. The Bulletin 192-82 standard is a levee design that was developed by DWR and recommended in *Bulletin 192, Delta Levees Investigation* report in 1982. The Delta Specific PL 84-99 standard was developed by the Corps. Levees that meet this standard may—if the levees are damaged in a disaster—qualify for federal rehabilitation assistance if they participate and are certified under the USACE PL 84-99 program.

For urban and urbanizing areas, such as the Pocket neighborhood in Maintenance Area No. 9, DWR's Urban Flood Risk Reduction (UFRR) Program supports implementation of regional flood damage reduction projects for urban areas protected by State Plan of Flood Control (SPFC) facilities to achieve, at least, an urban level of flood protection (defined in state law as protection from a 200-year flood). The UFRR Program will assist urban local agencies to plan, design, and construct flood risk reduction projects. The projects must rehabilitate, reconstruct, replace, or improve SPFC facilities in ways that improve flood protection.

## Next Steps

Council staff and the Arcadis team are finalizing the project report documenting the methodology used to help assess islands and tracts within the Delta and Suisun Marsh where State interests are at a higher risk.

Council staff and the Arcadis team will conduct outreach meetings with local stakeholders, other agencies, and subject matter experts to discuss how State interests have been identified in the DLIS effort and how risks to these State interests are being examined.

In the coming months, staff will seek input from Council members regarding the prioritizing of islands and tracts within the Delta and Suisun Marsh into categories ranging from higher risk to lower risk.

## Fiscal Information

Not applicable.

## List of Attachments

Attachment 1: Annual Probability of Flooding
Attachment 2: Risks to State Interests

## Contact

Dustin Jones
Supervising Engineer
Phone: (916) 445-5891